



PARTNERSHIP FOR LAND USE SCIENCE (FOREST-PLUS) PROGRAM

User guide for mForest, a mobile application for forest
inventory data collection



V. DAKSHINAMURTHY

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This report was prepared by:

Tetra Tech

159 Bank Street, Suite 300

Burlington, Vermont 05401 USA

Telephone: (802) 658-3890

Fax: (802) 495-0282

E-Mail: international.development@tetrattech.com

Tetra Tech Contacts:

Ben Caldwell, Chief of Party

159 Bank Street, Suite 300

P.O. Box 1397

Burlington, VT 05402

Tel: (802) 495-0282

Email: ben.caldwell@tetrattech.com

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TABLE OF CONTENTS

- TABLE OF CONTENTS..... 1**
- INTRODUCTION 2**
 - APPLICATION DESIGN 2
 - THE FOUR TOOLS..... 2
- STARTING UP MFOREST 3**
- PLOT LOCATION AND LAYOUT 5**
- TREE INVENTORY DATA COLLECTION 7**
- SOIL AND LITTER DATA COLLECTION..... 9**
- PLOT PICTURE 10**
- IMPLEMENTATION | USE SCENARIO 11**

INTRODUCTION

Forest-PLUS has developed a mobile application to enable forest inventory data collection, customized for India. The intended end users are Indian field foresters and community members involved in forest monitoring and management. The inclusion of local people and communities in managing the ecosystem services of forests is appropriate for India where community forest management and joint forest management are institutionalized and practiced.

APPLICATION DESIGN

The mobile application is intended to:

- Enable forest data collection at the plot level
- Reduce transposition and other errors in plot inventory data collection
- Support Tier 3 level forest carbon data collection and reporting
- Support REDD+ project development and on-going monitoring of forest carbon and other forest-related ecosystem services

The application and the device are designed as an extension of the Forest-PLUS Data Management System (DMS), a web-accessed tool for forest inventory sampling design, analysis and reporting. The DMS can provide plot locations and mForest can upload data directly to the DMS after collection. mForest can, however, be used and operated independently of the DMS if preferred.

The mobile application contains four main tool sets for field forest inventory.

THE FOUR TOOLS

1. Plot location and layout
2. Tree inventory data collection
3. Soil and Litter data collection
4. Plot picture

STARTING UP MFOREST

To begin using mForest, it must be installed onto an android smartphone. A username and password can be entered by the user to access projects (with associated plots) if the application is to be used with the DMS. These would be provided by the project administrator.

Users should then select the project, parcels, and plots they will be working on.

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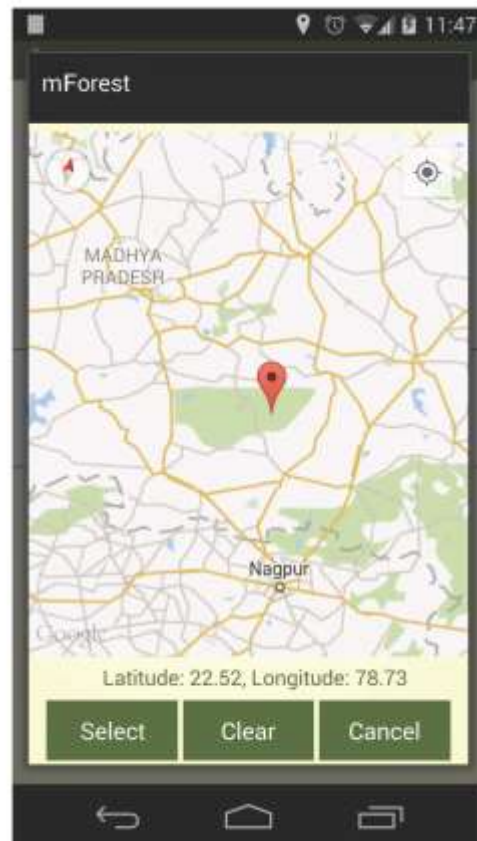
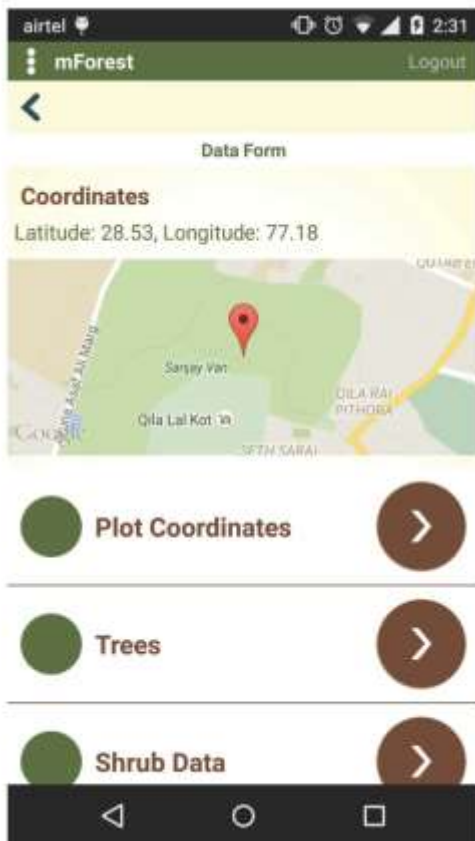
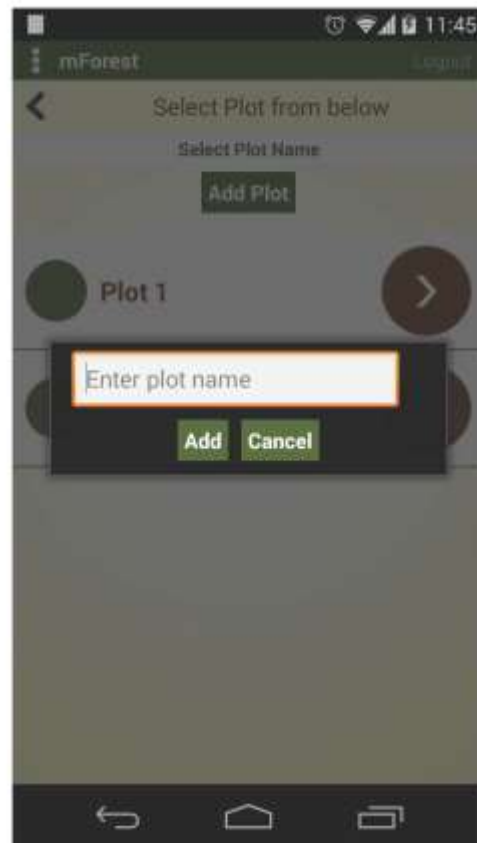


PLOT LOCATION AND LAYOUT

The app downloads a set of plots (names and coordinate information) through a “check out” routine (with connectivity to the DMS). The app can also download ancillary thematic maps to assist in navigation. These maps may include: transportation network, river network, DEM or topography, land use/cover, political boundaries, etc. The app clusters plots into groups to inform “smart” navigation for field crews.

This app utilizes the GPS location and navigation system of android platform cell phones. The app stores a list of plot names (IDs) and coordinate locations (lat/long or UTM). Field crews use the app to navigate to a plot center point. If the plot location meets certain criteria (e.g. is not inaccessible or doesn't include a road or river, or too close to a cliff or at the edge of a forest) it is accepted. If it is rejected then field crew navigates to the next plot location. When an accepted plot is located, the tool uses directional information (NESW) and distance from center point (m) to assist in laying out a plot – plot corners for rectangular plot and determining trees that are “in” or “out” with a specific radius for a circular plot.

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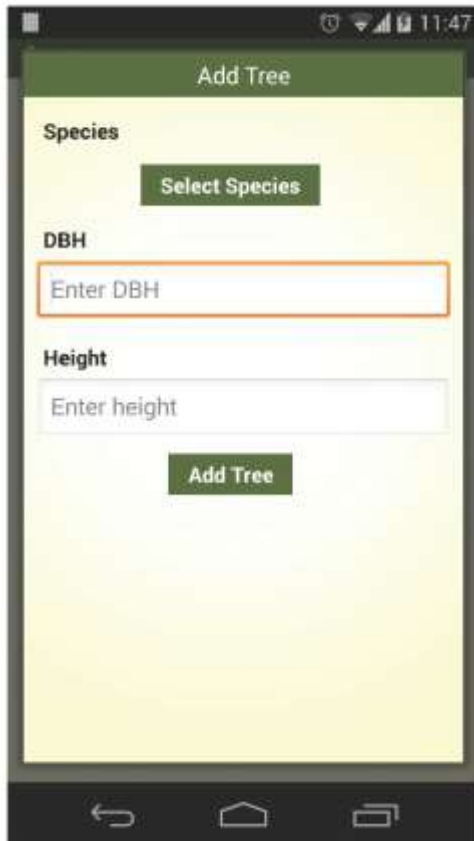


TREE INVENTORY DATA COLLECTION

This is a form app for plot level tree inventory data collection. The app includes a list of tree species and form fields for at least DBH (cm) and total tree height measurements (m), wood density, and tree crown measurements (drip line to drip line in two dimension at 90°). Plot metadata is included through a “check out” routine (with connectivity to the DMS) with users having additional fields for adding data and information. These fields include: Plot Name (ID), Parcel Name (ID), Project Name (ID), Crew, Plot Shape (pull-down with selection of “circular” or “rectangular”), Plot Dimensions (l radius = circular or length x width = rectangular), slope condition, comments. Date, start time and end time are automatically logged.

Data collected and logged are stored on the device until there is internet connection to upload the data to the DMS. This app also includes a QA/QC check on DBH and Height measurements recorded by “flagging” within a simple report, measurements that exceed a logic rule (for example, a tree DHB that is 4 times greater than the mean DBH of all trees).

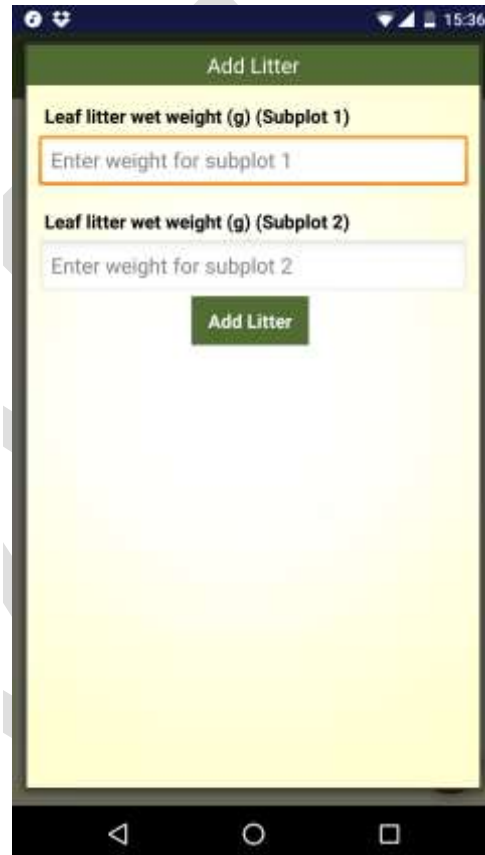
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SOIL AND LITTER DATA COLLECTION

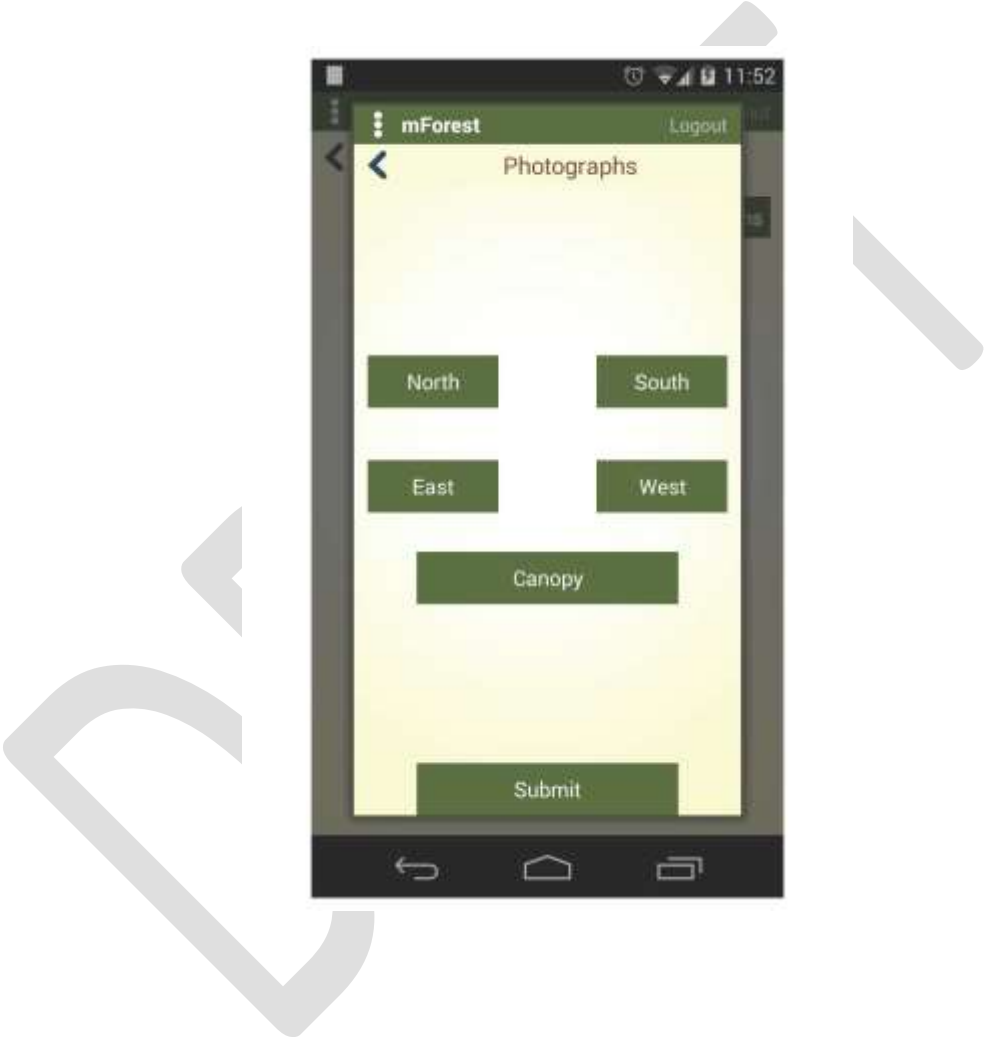
The app includes functionality for soil and litter data collection. In the field, soil samples would be collected against an approved methodology. To assist in inventory management, pre-generated barcodes can be attached to the soil samples in the field and scanned by the application. The plot and geolocation for the soil sample can thus be easily tracked through laboratory analysis.

Litter weight is similarly often taken in the field. Wet Weight can be quickly recorded in the application and is then associated with that plot in the record.



PLOT PICTURE

This app utilizes digital imaging capabilities as well as directional information in android platform cell phones. The app directs a user to take four field photographs of the plot. These are stored on the device and uploaded to the MRV system. A protocol directs the field crew to take one picture at each cardinal direction (NESW). Each photo is be tagged with an ID that specifies direction, location and plot name (ID). Additional information may be tagged to individual photos or to sets of photos. The user has an option to take additional field photos beyond the four cardinal direction photos.



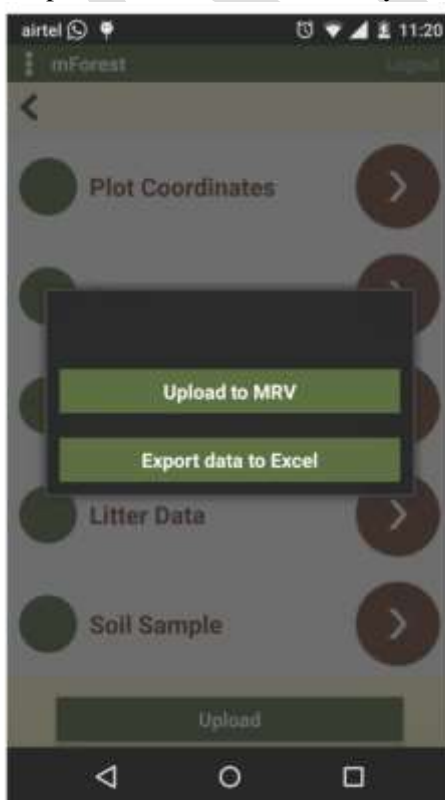
IMPLEMENTATION | USE SCENARIO

The mobile apps connect directly to the Forest-PLUS on-line DMS with any internet connection through a secure authenticated API. Log-in credentials from the device access a specific DMS user space. A user navigates to a project through a pull-down and then begins a “check-out” routine.

The “check-out” routine downloads: 1) plot information and additional maps for navigation and 2) plot metadata for use with the tree inventory data collection app.

A use scenario will include the following:

- DMS project defined →
- plot locations and number of plots defined in the DMS →
- allocation of work by plot locations, community forest area and community defined (Steps done by a forester using the DMS)
- android device “connected” to the DMS system
- data downloaded to the device for specific set of plots, community forest and village.
- Device “checked” out by community data collection team →
- data collection at each plot in the workflow (Plot layout from a center point, tree species and dbh recorded, digital pictures in all cardinal directions, digital forest canopy pictures, voice recording, and video recording)
- A “check-in” routine will upload data captured through the four apps to the associated project in the DMS database.
- Calculations are computed and reported back to the community.



Alternatively, a user can use the app as a stand-alone tool for data entry. In this use case, data may be exported as a .csv or .xls file from the application to the device's internal memory.

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U.S. Agency for International Development

1300 Pennsylvania Avenue, NW

Washington, DC 20523

Tel: (202) 712-0000

Fax: (202) 216-3524

www.usaid.gov